

Remarks/ Arguments

Upon entry of the foregoing amendments, claims 1 to 4, 5 to 19, and 21 to 25 will be pending in this patent application. Claims 1, 4, 7 to 12, 15 to 17, and 21 to 23 have been amended, without prejudice. Claims 5, 18, and 20 have been canceled, without prejudice.

The Action includes rejections under 35 U.S.C. §§ 103(a) and 112, second paragraph. In view of the foregoing amendments and the following remarks, reconsideration and withdrawal of the rejections are requested respectfully.

Response to the May 17 Notice

The Notice alleges that claim 20 was amended without demarcations indicating the changes. Applicants note that claim 20 was not amended. Rather, due to a formatting problem, the superscripts "10" and "11" in the expression " 1×10^{10} to 1×10^{11} ohm-cm" were presented in a "normal" font, thus giving the appearance that Applicants' intended to amend claim 20. The Listing of Claims presented above has corrected the formatting problem and reflects claim 20 in its original (as filed) form.

Response to the Omission Notice

The Omission Notice indicates that Applicants' failed to correct a flaw in the Reply dated February 28, 2006. In this regard, the February 28, 2006 Reply incorrectly characterized the Action's alleged motivation as supported by Applicants' own disclosure. This is indeed not the case as the Action was referring to the Schafheutle reference. The present Reply correctly refers to the Action's alleged support for motivation in its application of 35 U.S.C. § 103(a). Applicants' representative apologizes for this oversight.

Discussion of the Rejections Under 35 U.S.C. § 112, Second Paragraph

Claims 1 to 24 have been rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter that Applicants regard as their invention. For the reasons detailed below, Applicants respectfully traverse this rejection.

Claims 1, 4, 8, 11, 15 to 17, 22, and 23 were rejected as indefinite because the phrase “selected from” was allegedly unclear. Although Applicants disagree respectfully that such phrase is unclear, Applicants have amended the claims so the disputed phrase now reads “selected from the group consisting of” as suggested by the Examiner. Accordingly, Applicants submit that this rejection is now moot.

Claims 3, 5, 6, 9, and 10 were rejected as indefinite because Applicants allegedly failed to specify bases for the claimed weight percent. Applicants disagree respectfully.

Indeed, acceptability of the claim language depends on whether one of ordinary skill in the art would understand what is claimed, in light of the specification” (MPEP at 2100-208 Rev. 2, May 2004). The burden is on the Office to provide evidence or technical reasoning to support a contention that one of ordinary skill in the art would not be able to understand the meaning of the claim terms. MPEP § 2173.02. The standard to apply is whether the claims “define the patentable subject matter with a reasonable degree of particularity and distinctness” (id. at 2100-208 Rev. 2, May 2004) (emphasis in the original).

Applicants’ specification clearly establishes the bases for the claimed weight percents. For example, Applicants’ specification at page 6, lines 22 to 24, states:

[t]he amount of at least one diisocyanate within the isocyanate terminated prepolymer may range from about 20% to about 30% by weight of the reaction mixture (excluding solvent if present).

Thus, when the instant claims are read in light of the specification as they should be, one skilled in the art would indeed understand the bases for the claimed weight percents. *In re Cohn*, 169 USPQ 95 (C.C.P.A. 1971) (the claims must be read in light of the specification).

Claim 4 is rejected as indefinite because the term “derivatives” is allegedly unclear. Although Applicants disagree respectfully that such term renders claim 4 indefinite, Applicants have deleted the term in an effort to advance prosecution of the present patent application. Accordingly, the rejection is moot.

Claim 8 is rejected as allegedly indefinite. Applicants submit respectfully that this rejection is moot in view of the foregoing amendments.

Claim 12 is rejected as indefinite because the phrase “the first reacting step” allegedly lacks antecedent basis. Applicants submit respectfully that this rejection is moot in view of the foregoing amendments.

Claim 19 is rejected as indefinite because it is allegedly unclear what degree of crystallinity may be present and still satisfy the language “substantially free”. Acceptability of the claim language, however, depends on whether one of ordinary skill in the art would understand what is claimed, in light of the specification” (MPEP at 2100-208 Rev. 2, May 2004). The burden is on the Office to provide evidence or technical reasoning to support a contention that one of ordinary skill in the art would not be able to understand the meaning of the claim terms. MPEP § 2173.02. The standard to apply is whether the claims “define the patentable subject matter with a reasonable degree of particularity and distinctness” (id. at 2100-208 Rev. 2, May 2004) (emphasis in the original). Applicants’ specification at, e.g., page 22 and Figure 2 provide the guidance to one of ordinary skill in the art to determine what degree of crystallinity may be present and still satisfy the language “substantially free.” Indeed, from such teachings, one skilled in the art would know how to use a differential scanning calorimeter to measure thermal transitions related to crystallinity to determine

whether a polymer is “substantially” free of crystallinity. Accordingly, reconsideration and withdrawal of the rejection is requested respectfully.

Discussion of the Rejection Under 35 U.S.C. § 103(a)

Claims 1 to 24 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. patent application Publication No. US 2003/0083457 to Schafheutle et al. (“the 457 publication”) in view of U.S. Patent No. 6,515,070 to Kobylanska et al. (“the 070 patent”), U.S. Patent No. 5,354,807 to Dochniak et al. (“the 807 patent”), U.S. Patent No. 5,270,433 to Klauck et al. (“the 433 patent”), U.S. Patent No. 5,576,382 to Seneker et al. (“the 382 patent”), and U.S. Patent No. 4,855,077 to Shikinami et al. (“the 077 patent”). Applicants respectfully traverse this rejection.

To establish a *prima facie* case of obviousness, however, “there must be some teaching, suggestion or motivation in the prior art to make the specific combination that was made by the applicant.” *In re Dance*, 160 F.3d 1339, 1343, 48 USPQ2d 1635, 1637 (Fed. Cir. 1998). “The invention must be viewed not with the blueprint drawn by the inventor, but in the state of the art that existed at the time.” *In re Dembiczak*, 50 U.S.P.Q.2d 1614, 1617 (Fed. Cir. 1999) (quoting *Interconnect Planning Corp. v. Feil*, 227 U.S.P.Q. 543, 547 (Fed. Cir. 1985). “In other words, the examiner must show reasons that the skilled artisan, confronted with the same problem as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed.” *In re Rouffet*, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1458 (Fed. Cir. 1998).

Applicants’ Claimed Invention

Applicants’ claimed invention defines a process for forming an aqueous polyurethane dispersion with surprising properties relative to prior art aqueous polyurethane dispersions.

Applicants have discovered that the particular claimed combination of process step sequence and materials produces an aqueous polyurethane dispersion that is substantially **non-crystalline** and has a weight average molecular weight ranging from **40,000 to 60,000 g/mol**, and wherein the aqueous polyurethane dispersion, when dried, has a **base volume resistivity ranging from 1×10^{10} to 1×10^{11} ohm-cm**. Such recitations – and in particular the claimed molecular weight range of 40,000 to 60,000 g/mol – surprisingly enable the polymer to be particularly suitable for use as a tacky, conductive adhesive for electronic applications.

In this regard, Applicants' claimed process comprises the steps of providing an isocyanate terminated prepolymer by reacting (i) at least one polyisocyanate comprising about 50% by weight or greater of $\alpha,\alpha,\alpha,\alpha$ -tetramethylxylene diisocyanate, (ii) at least one difunctional polyol comprising polypropylene glycol, and (iii) at least one isocyanate reactive compound comprising an acid functional group and at least two isocyanate reactive groups selected from the group consisting of a hydroxy, a primary amino, a secondary amino, and combinations thereof; neutralizing the isocyanate reactive compound (iii) with a neutralizing agent comprising an amine group; reacting the isocyanate terminated prepolymer with at least one chain terminating agent; dispersing the isocyanate terminated prepolymer in water; and reacting the isocyanate terminated prepolymer with at least one chain extending agent comprising an organic diamine, wherein the polyurethane polymer is substantially non-crystalline and has a weight average molecular weight ranging from 40,000 to 60,000 g/mol, and wherein the aqueous polyurethane dispersion, when dried, has a base volume resistivity ranging from 1×10^{10} to 1×10^{11} ohm-cm (see, e.g., claim 1).

As detailed below, one of ordinary skill in the art at the time of the present invention would not have been motivated to combine the cited references in such a way that would produce Applicants' claimed invention.

The 457 Publication

The 457 publication discloses an aqueous dispersion comprising a high molar mass polyurethane A and also additives B selected from mercaptans, hydrazides, and N-alkylamides. According to the 457 publication, particularly suitable additives B of this kind contain two of the reactive groups mentioned; that is, two groups selected from hydrazide groups, mercaptan groups, and N-alkylamide groups. It is preferred for one molecule to contain two identical reactive groups, viz dihydrazides, dimercaptans, and bis(N-alkylamides). The polyurethanes of the 457 publication are particularly suitable for use as binders in aqueous paints and other coatings (see the 457 publication at paragraphs [0002] to [0006]).

The Differences Between Applicants' Claimed Invention and the 457 Publication

The differences between Applicants' claimed invention and the 457 publication are significant because Applicants' claimed invention defines a **specific combination** of reactants, a specific molecular weight range (40,000 to 60,000), and specific properties (noncrystalline and base volume resistivity) that are not taught or suggested by the 457 publication. In this regard, Applicants' claimed invention recites the step of reacting (i) at least one polyisocyanate comprising about **50% by weight or greater of $\alpha,\alpha,\alpha,\alpha$ -tetramethylxylene diisocyanate**, (ii) at least one difunctional polyol comprising **polypropylene glycol**, and (iii) at least one isocyanate reactive compound comprising an acid functional group and at least two isocyanate reactive groups selected from the group consisting of a hydroxy, a primary amino, a secondary amino, and combinations thereof. The claimed combination of reactants surprisingly produces an aqueous polyurethane dispersion that is substantially **non-crystalline** and wherein the aqueous polyurethane dispersion, when dried, has a **base volume resistivity ranging from 1×10^{10} to 1×10^{11}**

ohm-cm. As detailed above, these properties enable the polymer to be particularly suitable for use as a tacky adhesive for electronic applications.

Moreover, Applicants' claimed invention defines a polyurethane polymer having a weight average molecular weight ranging from **40,000 to 60,000 g/mol**. Applicants have found that this molecular weight is ideally suited for use as a lamination adhesive for electronic devices because it coats an uneven electronic substrate wherein higher molecular weight polyurethanes leave voids over such pores and gaps where the adhesive is not in direct physical contact with the substrate. Table III at page 22 of Applicants' specification underscores the importance of the claimed molecular weight range. In this regard, the maximum peel strength, the average peel strength, and the ease of lamination – characteristics that are important to an electronics adhesive application – were evaluated based upon the molecular weight. Examples 4 and 6, each of which had a molecular weight outside of the claimed range of 40,000 to 60,000 g/mol (28,245 and 91,938, respectively) exhibited inferior performance with respect to these important properties. Although the 457 publication discloses polyurethanes having molecular weights within this range, the 457 publication does not teach or suggest the importance of the upper limit of **60,000 g/mol**; rather, the 457 publication merely teaches that its polyurethanes should be "at least" 20,000 g/mol (see, e.g., the 457 publication at page 1, paragraph [0008]).

There is No Motivation to Combine the 457 Publication With the Cited Secondary References in a Way that would Produce Applicants' Claimed Invention

As discussed above, the 457 publication does not teach or suggest the importance of the claimed combination of the molecular weight range, noncrystallinity, base volume resistivity, and the specific combination of reactants. To remedy these deficiencies, the Action combines the 457 publication with the 070 patent, the 807 patent, the 433 patent, the 382 patent, and the 077 patent. For the following reason, Applicants submit respectfully that such combination is improper as one of ordinary skill in the art at the time of the present

invention would not have been motivated to combine the cited references in a way that would produce Applicants' claimed invention.

Regarding the use of the specific reactants recited by Applicants' claimed invention (TMXDI and polypropylene glycol), the Action asserts that it was within the knowledge of one of ordinary skill in the art to use such reactants. In support, the Action notes that the 070 patent and the 807 patent disclose the use of TMXDI in the production of polyurethane dispersions is advantageous because the products possess lower viscosity and require less solvent. The Action also notes that the 382 patent discloses that the use of polypropylene glycol in making aqueous polyurethane dispersions improved elastic properties of the polyurethane. Finally, the Action notes that the 433 patent teaches the use of TMXDI and polypropylene glycol together in making a polyurethane. Despite these teachings, however, the prior art – as a whole – fails to teach or suggest Applicants' claimed invention – as a whole.

For example, although the 433 patent teaches the use of TMXDI and polypropylene glycol together in making an aqueous polyurethane adhesive, it is **completely silent** with respect to molecular weight of the polyurethanes. Indeed, as discussed above, Table III of Applicants' specification provides strong evidence that the claimed unique molecular weight range of 40,000 to 60,000 g/mol yields **surprising results** with respect to adhesion and lamination.

Although it would have been theoretically **possible** to modify the 457 disclosure by using TMXDI and polypropylene glycol to make an aqueous polyurethane and, despite the lack of teaching in the cited references with respect to the claimed molecular weight, make a polyurethane within the claimed molecular weight range, much more is required in the context of Section 103. The mere **possibility** that the prior art can be modified or improved does not itself provide the requisite motivation to do so. *In re Dien*, 152 U.S.P.Q. 550

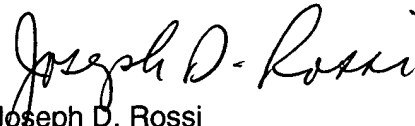
(C.C.P.A. 1967) (incentive to seek improvement of existing process held to not render change made by applicant obvious, even where the change was one capable of being made from theoretical point of view). The mere possibility for modification and improvement is not the "motivating force" that the Board and the Federal Circuit have invariably required. If it were, then no modification would ever lack motivation since *some* change is always possible. It is only with the improper use of hindsight and with the benefit of the Applicant's disclosure that one can discern the desirability of their claimed invention. Accordingly, reconsideration and withdrawal of the rejection is respectfully requested.

Conclusion

Applicants believe that the foregoing constitutes a complete and full response to the Action of record. Applicants respectfully submit that this application is now in condition for allowance. Accordingly, an indication of allowability and an early Notice of Allowance are respectfully requested.

The Commissioner is hereby authorized to charge the fee required and any additional fees that may be needed to Deposit Account No. 01-0493 in the name of Air Products and Chemicals, Inc.

Respectfully submitted,

A handwritten signature in black ink, reading "Joseph D. Rossi". The signature is written in a cursive style with a large, stylized "J" and "R".

Joseph D. Rossi
Registration No. 47,038
7201 Hamilton Boulevard
Allentown, PA 18195-1501
(610) 481-8169